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Radius of Fiber and Axis Formulas

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List of 16 Radius of Fiber and Axis Formulas

Radius of Fiber and Axis

1) Radius of centroidal axis of curved beam given bending stress

$$fx \quad R = \left(\frac{M_b \cdot y}{A \cdot \sigma_b \cdot (R_N - y)} \right) + R_N$$

[Open Calculator !\[\]\(a870788d6ed9b8fd294b7654a8c8526b_img.jpg\)](#)

ex

$$89.72787\text{mm} = \left(\frac{245000\text{N} \cdot \text{mm} \cdot 21\text{mm}}{240\text{mm}^2 \cdot 53\text{N}/\text{mm}^2 \cdot (83.22787\text{mm} - 21\text{mm})} \right) + 83.22787\text{mm}$$

2) Radius of centroidal axis of curved beam given eccentricity between axis

$$fx \quad R = R_N + e$$

[Open Calculator !\[\]\(6a9b39b98eb945faa14c645ec99e4eaa_img.jpg\)](#)

$$ex \quad 89.72787\text{mm} = 83.22787\text{mm} + 6.5\text{mm}$$

3) Radius of centroidal axis of curved beam of circular section given radius of inner fiber

$$fx \quad R = R_i + \frac{d}{2}$$

[Open Calculator !\[\]\(f1c5da15572e3e09d343161be98f508d_img.jpg\)](#)

$$ex \quad 86\text{mm} = 76\text{mm} + \frac{20\text{mm}}{2}$$



4) Radius of centroidal axis of curved beam of rectangular section given radius of inner fiber

$$fx \quad R = R_i + \frac{y}{2}$$

[Open Calculator !\[\]\(cbe80b694ebd74fcfe136a095b608235_img.jpg\)](#)

$$ex \quad 86.5\text{mm} = 76\text{mm} + \frac{21\text{mm}}{2}$$

5) Radius of inner fiber of circular curved beam given radius of neutral axis and outer fiber

$$fx \quad R_i = \left(\sqrt{4 \cdot R_N} - \sqrt{R_o} \right)^2$$

[Open Calculator !\[\]\(3e2231b1ad3ca8da8658228c00dd08e0_img.jpg\)](#)

$$ex \quad 71.36707\text{mm} = \left(\sqrt{4 \cdot 83.22787\text{mm}} - \sqrt{96\text{mm}} \right)^2$$

6) Radius of inner fiber of curved beam given bending stress at fiber

$$fx \quad R_i = \frac{M_b \cdot h_i}{A \cdot e \cdot (\sigma_b)_i}$$

[Open Calculator !\[\]\(0d5ec72f61334709c3fc9450209b754f_img.jpg\)](#)

$$ex \quad 75.0245\text{mm} = \frac{245000\text{N} \cdot \text{mm} \cdot 37.5\text{mm}}{240\text{mm}^2 \cdot 6.5\text{mm} \cdot 78.5\text{N}/\text{mm}^2}$$

7) Radius of inner fiber of curved beam of circular section given radius of centroidal axis

$$fx \quad R_i = R - \frac{d}{2}$$

[Open Calculator !\[\]\(b64b40baaee5acddc1eab8538ba84754_img.jpg\)](#)

$$ex \quad 79.72787\text{mm} = 89.72787\text{mm} - \frac{20\text{mm}}{2}$$



8) Radius of inner fiber of rectangular curved beam given radius of neutral axis and outer fiber

$$fx \quad R_i = \frac{R_o}{e^{\frac{y}{R_N}}}$$

[Open Calculator !\[\]\(e78f798d4ea5c530c9db49e7d26e6b95_img.jpg\)](#)

$$ex \quad 74.59167\text{mm} = \frac{96\text{mm}}{e^{\frac{21\text{mm}}{83.22787\text{mm}}}}$$

9) Radius of inner fibre of curved beam of rectangular section given radius of centroidal axis

$$fx \quad R_i = R - \frac{y}{2}$$

[Open Calculator !\[\]\(05be7c7a8995decd503647c99211f7c2_img.jpg\)](#)

$$ex \quad 79.22787\text{mm} = 89.72787\text{mm} - \frac{21\text{mm}}{2}$$

10) Radius of neutral axis of curved beam given bending stress

$$fx \quad R_N = \left(\frac{M_b \cdot y}{A \cdot \sigma_b \cdot e} \right) + y$$

[Open Calculator !\[\]\(fe3aebe81acea8d45108cd2768939da7_img.jpg\)](#)

$$ex \quad 83.22787\text{mm} = \left(\frac{245000\text{N} \cdot \text{mm} \cdot 21\text{mm}}{240\text{mm}^2 \cdot 53\text{N}/\text{mm}^2 \cdot 6.5\text{mm}} \right) + 21\text{mm}$$

11) Radius of neutral axis of curved beam given eccentricity between axis

$$fx \quad R_N = R - e$$

[Open Calculator !\[\]\(899d8b7697d64725bf017d3296cfcf1b_img.jpg\)](#)

$$ex \quad 83.22787\text{mm} = 89.72787\text{mm} - 6.5\text{mm}$$



12) Radius of neutral axis of curved beam of circular section given radius of inner and outer fibre

$$fx \quad R_N = \frac{(\sqrt{R_o} + \sqrt{R_i})^2}{4}$$

[Open Calculator !\[\]\(e2376d476d06eb31946dc01a69a4403a_img.jpg\)](#)

$$ex \quad 85.70831\text{mm} = \frac{(\sqrt{96\text{mm}} + \sqrt{76\text{mm}})^2}{4}$$

13) Radius of neutral axis of curved beam of rectangular section given radius of inner and outer fiber

$$fx \quad R_N = \frac{y}{\ln\left(\frac{R_o}{R_i}\right)}$$

[Open Calculator !\[\]\(0b5e7e25e8775f7e7e80906ada4f0021_img.jpg\)](#)

$$ex \quad 89.89155\text{mm} = \frac{21\text{mm}}{\ln\left(\frac{96\text{mm}}{76\text{mm}}\right)}$$

14) Radius of outer fiber of circular curved beam given radius of neutral axis and inner fiber

$$fx \quad R_o = \left(\sqrt{4 \cdot R_N} - \sqrt{R_i}\right)^2$$

[Open Calculator !\[\]\(bd3b31712ad9bab5a241210fa6925cdd_img.jpg\)](#)

$$ex \quad 90.78401\text{mm} = \left(\sqrt{4 \cdot 83.22787\text{mm}} - \sqrt{76\text{mm}}\right)^2$$


15) Radius of outer fiber of rectangular curved beam given radius of neutral axis and inner fiber

$$fx \quad R_o = R_i \cdot e^{\frac{y}{R_N}}$$

[Open Calculator !\[\]\(7bc43b319a082987e20f7bf78f4bab80_img.jpg\)](#)

$$ex \quad 97.81253\text{mm} = 76\text{mm} \cdot e^{\frac{21\text{mm}}{83.22787\text{mm}}}$$



16) Radius of outer fibre of curved beam given bending stress at fiber 

$$fx \quad R_o = \frac{M_b \cdot h_o}{A \cdot e \cdot (\sigma_{bo})}$$

[Open Calculator](#) 

$$ex \quad 88.68778\text{mm} = \frac{245000\text{N} \cdot \text{mm} \cdot 48\text{mm}}{240\text{mm}^2 \cdot 6.5\text{mm} \cdot 85\text{N}/\text{mm}^2}$$







Variables Used

- **A** Cross Sectional Area of Curved Beam (*Square Millimeter*)
- **d** Diameter of Circular Curved Beam (*Millimeter*)
- **e** Eccentricity Between Centroidal and Neutral Axis (*Millimeter*)
- **h_i** Distance of Inner Fibre from Neutral Axis (*Millimeter*)
- **h_o** Distance of Outer Fibre from Neutral Axis (*Millimeter*)
- **M_b** Bending Moment in Curved Beam (*Newton Millimeter*)
- **R** Radius of Centroidal Axis (*Millimeter*)
- **R_i** Radius of Inner Fibre (*Millimeter*)
- **R_N** Radius of Neutral Axis (*Millimeter*)
- **R_o** Radius of Outer Fibre (*Millimeter*)
- **y** Distance from Neutral Axis of Curved Beam (*Millimeter*)
- **σ_b** Bending Stress (*Newton per Square Millimeter*)
- **σ_{bi}** Bending Stress at Inner Fibre (*Newton per Square Millimeter*)
- **σ_{bo}** Bending Stress at Outer Fibre (*Newton per Square Millimeter*)



Constants, Functions, Measurements used

- **Constant:** **e**, 2.71828182845904523536028747135266249
Napier's constant
- **Function:** **ln**, ln(Number)
The natural logarithm, also known as the logarithm to the base e, is the inverse function of the natural exponential function.
- **Function:** **sqrt**, sqrt(Number)
A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.
- **Measurement:** **Length** in Millimeter (mm)
Length Unit Conversion 
- **Measurement:** **Area** in Square Millimeter (mm²)
Area Unit Conversion 
- **Measurement:** **Torque** in Newton Millimeter (N*mm)
Torque Unit Conversion 
- **Measurement:** **Stress** in Newton per Square Millimeter (N/mm²)
Stress Unit Conversion 



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